

FIT SOCIETY®

PAGE

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American College of Sports Medicine

NUTRITION

eating for strength and power

by Susan M. Kleiner, Ph.D., R.D.

Years ago, planning a diet to gain weight was easy; just eat a lot of calories. Today we know that it's not just calories, but when they are consumed and where those calories come from that counts when trying to gain weight.

A Building Plan

Building muscle requires tremendous energy: energy to do muscle-building exercise, plus the energy to build the tissue itself. In a 1990 study, researchers determined that the energy requirement for strength-trainers to maintain their muscle mass was 44 kilocalories per kilogram body weight (about 20 kcals/lb). Further research has shown that to build muscle and maintain cardiovascular fitness, serious athletes need at least 52 kcals/kg (about 23.6 kcals/lb.) or more.

Getting enough calories is important, but so is consuming the right kind of calories. The predominant fuel for muscle-building exercise is carbohydrate. The harder and longer your workout, the more carbohydrate your muscles need to store. Once your muscles are depleted of stored fuel, fatigue sets in and your workout is over.

The bottom line is that with 500-600 grams of carbohydrate a day, your muscles will stay packed with enough carbohydrate to power both strength and cardiovascular training. To personalize carbohydrate needs, base your intake on

a figure of eight to nine grams of carbohydrate per kg body weight (about 3.6-4.1 g/lb).

At this point you might be wondering, "What about protein? Don't I need more protein to increase my body weight?" Protein is the basic building material for muscle tissue, and it is required in higher amounts in the diets of individuals performing strength-training exercise. In the same study that looked at the energy needs of strength trainers, the researchers found that during resistance-training exercise, the subjects required 1.2 to 1.3 grams of protein per kg per day (about 0.54-0.59 g/lb) to maintain their muscle mass, as long as their energy needs were met. If the intensity of the exercise was increased in order to increase muscle tissue, the requirements were increased up to 1.5 grams/kg/day (about 0.68g/lb). However, if calorie intake is reduced to achieve muscle gain and fat loss at the same time, then protein needs increase to 1.8 - 2.0 grams/kg body weight per day (about 0.81-0.9g/lb).

Diet Plan	Protein	Carbohydrate
Maintain/Adequate Calories	1.2-1.3 g/kg	8-9 g/kg
Build/Adequate Calories	1.5-1.6 g/kg	8-9 g/kg
	0.68-0.73 g/lb	3.6-4.1 g/lb
Gain Muscle — Lose	1.8-2.0 g/kg	5-6 g/kg
Fat/Calorie Deficit	0.81-0.9 g/lb	2.3-2.7 g/lb
		to make room for extra protein with fewer calories

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Letter from the Editor

Welcome to the Summer 2002 issue of the *ACSM Fit Society Page*® Newsletter. In this edition of the newsletter, sports medicine and exercise science experts examine Nutrition and Sport. If you are interested in making better, healthier food choices for improving your performance, then this is the issue for you! Whether you're a competitive athlete or someone who exercises to improve health and fitness, you know the importance of good nutrition. One of the feature articles in this issue provides an explanation of the glycemic index and how it can be applied to everyday healthy nutrition. If you have concerns about getting enough antioxidants, vitamins and minerals and protein into your diet, then the information contained in the Summer issue will help meet your daily needs. We have also included the first of a two-part series on fat-burning aids. And as always, we have regular features including the *Athlete's Kitchen* and our popular *Question and Answer* section.

We hope you enjoy this issue of *ACSM Fit Society Page* and find information that you can use to enhance your health and your family's health and wellness. If you have any questions or comments, please be sure to contact us.

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Q&A with ACSM

by Bryan W. Smith, M.D., Ph.D., FACSM

Q: My son's football coach has suggested he take creatine as a supplement to get bigger. He is 16 years old. Is it harmful for him to take creatine?

A: Creatine is a substance that our bodies use for quick energy during high-intensity exercise. Not only do our bodies synthesize creatine, we obtain creatine from the foods we eat, particularly meat. It's fairly well established that ingesting extra creatine can improve most individuals' ability to perform repetitive high-intensity activity such as resistance training or sprint training. This is due to being able to perform more work without fatiguing.

No sports medicine organization — including ACSM — has recommended use in individuals under the age of 18. This is primarily due to the lack of known

safety in ingesting extra creatine. In contrast to prescription drugs that undergo strict safety profiles and still have some unforeseen dangers, there is no governmental regulation on the purity or safety of nutritional supplements such as creatine. There have been many anecdotal reports of weight gain, muscle cramping, abdominal cramping, nausea and diarrhea associated with creatine use. A few anecdotal reports have linked creatine to high blood pressure and reversible kidney dysfunction. The most alarming direct finding of creatine usage to date is that of increased compartment pressure in the lower leg in the exercising athlete. There has been one instance that I am aware of concerning a football athlete who suffered irreversible muscle damage with creatine use being the likely underlying cause.

American College of Sports Medicine FIT SOCIETY PAGE

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With all the scientific information available, I think it's not possible to be certain that creatine usage is safe. Therefore, I would not recommend using creatine.

Q: My son is in college and told me that he is taking some fat-burning supplements to get "ripped" for summer vacation. One of the products contains ephedrine and I have some concerns. Is it safe?

Ephedrine (or ma huang) is a stimulant. It increases one's metabolism by increasing heart rate, respiratory rate, blood pressure, and opening the airways. This stimulant has been of concern to numerous health-care professionals due to its indiscriminate use and potential for serious, if not catastrophic, harm. Numerous deaths have been attributed

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Series



THE SKINNY ON "FAT BURNERS"

by Katherine Beals, Ph.D., R.D.

Editor's Note: This article is a two-part series. Part two will appear in the Fall edition of the newsletter, scheduled to be posted to the

ACSM Web Site during the first week of September.

Lose weight without dieting or exercising! Turn your body into a fat-burning machine! Lose the fat, keep the muscle! These are just a few of the claims being made by the marketers of "fat-burning" supplements. If they sound too good to be true, it's because they are. Most of these claims are not based on scientific evidence, but rather pseudoscience, half-truths, and sometimes outright lies!

Indeed, a good many of the currently popular "fat-burning" supplements contain substances that are at best completely ineffective and at worst potentially dangerous. The most popular "fat-burning" supplements on the market today can be placed into three broad categories: (1) those that claim to increase fat oxidation and/or metabolic rate; (2) those that inhibit the absorption of dietary fat; and (3) those that inhibit the synthesis of fat.

Supplements that claim to increase metabolic rate and/or fat oxidation:

THERMOGENIC PRODUCTS:**What are they?**

By far the most popular fat-burning supplements on the market today are the "thermogenic" products. Brands use the term "thermogenic" to not only give the consumer the impression that the product will "burn fat," but to imply "thermogenesis," or an increase in metabolism or energy expenditure. The primary ingredient in all of these products is ephedrine, a synthetic version of the Chinese herb Ephedra or ma huang. Ephedrine is found in a variety of over-the-counter

asthma, cold, and allergy medications because of its effectiveness as a bronchodilator and decongestant. Similar to their chemical cousins, amphetamines or "speed," ephedrine and its herbal alkaloids (Ephedra and ma huang), are powerful central nervous system stimulants that exert stimulatory effects on many parts of the body simultaneously including lungs, heart, blood vessels, adrenal glands, etc. Because ephedrine acts as a general sympathetic nervous system stimulant, it can promote small but significant increases in metabolic rate. It also seems to induce a temporary suppression of appetite which, taken together, account for its supposed "fat burning" potential.

Do they work?

Research does suggest that ephedrine, particularly when combined with caffeine (and calorie restriction) can increase weight loss. For example, in a study comparing the effects of supplementing with ephedrine alone (20 mg), caffeine alone (200 mg), ephedrine plus caffeine (20 mg + 200 mg, respectively), or a placebo for 24 weeks, obese men and women lost significantly more weight with the ephedrine plus caffeine combination than the other three groups. Similarly, a more recent study found that obese men and women who took 72 mg/d ephedrine and 240 mg/d caffeine for eight weeks lost significantly more weight (4.0 kg) and body fat (2.1 percent) than those who took a placebo (.8 kg and .2 percent, respectively). It should be noted that the "fat burning" effects of ephedrine do seem to decrease over time (i.e., weight loss slows or stops after about 12 weeks), and ephedrine has no effect after discontinuation.

Are they safe?

Since 1997, the FDA has documented at least 70 deaths and more than 1,400 "adverse events" involving people who had taken supplements containing ephedrine, Ephedra or Ma Haung. The adverse events included heart attacks, strokes,

seizures and psychotic episodes. Most occurred in otherwise healthy young to middle-aged adults using the products for weight control or increased energy. Other documented complaints included dizziness, headache, gastrointestinal distress, insomnia, heart palpitations, anxiety and irritability. In response to the large number of adverse reports, the FDA, in 1997, proposed tougher restrictions on the manufacturing and sales of ephedrine and recommended limiting the amount of ephedrine alkaloids consumed per dose (8 mg) and per day (24 mg). Unfortunately these regulatory efforts were thwarted by the General Accounting Office (Congress's investigative arm) who determined the FDA did not have adequate scientific evidence to justify restrictions on ephedrine dosing. Thus, despite the reports of adverse events and the warnings issued by the FDA, companies can still legally sell products containing ephedra (and its alkaloids).

The bottom line

At present, ephedrine's (and its alkaloids) undeniable risks far outweigh its potential benefits. Not only that, but ephedrine, like amphetamines, is addictive and individuals often develop a tolerance to it (meaning they need more and more to derive the same effects). Moreover, combining ephedrine with caffeine (as is commonly done in fat burning supplements) increases the risks of side effects. Ephedrine is a dangerous supplement with the potential to cause serious harm to health. There is really only one question to ask when considering supplementing with ephedrine: "Is weight loss worth dying for?"

CONJUGATED LINOLEIC ACID**What is it?**

Conjugated Linoleic Acid (CLA) is a naturally-occurring isomer of the essential fatty acid linoleic acid (also known as omega 6 fatty acid). CLA is found in beef and

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Fat Burners

(Continued from page 3)

dairy products (as opposed to linoleic acid found primarily in vegetable oils). The claims for CLA are similar to those for the other “fat-burners;” it is purported to increase thermogenesis (*i.e.*, energy expenditure), enhance fat oxidation (*i.e.*, burn fat), and promote muscle tissue synthesis.

Does it work?

Virtually all of the research on CLA has been done in animals, and the results consistently show that supplementation leads to increases in lean body mass and reductions in body fat. In contrast, the few studies conducted on human subjects have found no beneficial effect of CLA supplementation on body fat, muscle mass, or weight loss.

Is it safe?

No adverse effects of CLA supplementation were reported in the animal studies; however, in one of the human studies, one-third of the supplemented subjects complained of gastrointestinal distress (*i.e.*, bloating, cramping, and diarrhea).

The bottom line:

If you are an overweight rat, mouse or rabbit, CLA can give you the thin physique you are seeking (and probably make you the envy of guinea pigs). However, if you are a human looking for weight loss in a pill, you better keep looking!

CHROMIUM PICOLINATE

What is it?

Chromium is an essential trace mineral that is found naturally in brewer’s yeast, whole grain cereals, corn, peas, broccoli, mushrooms and prunes. Chromium is an essential component of glucose tolerance factor, a substance that augments the effects of insulin. Insulin is a hormone that regulates blood sugar (glucose) levels

and enhances amino acid uptake and protein synthesis. It is chromium’s indirect role in insulin function that forms the basis for the misleading claims, such as “lose the fat and keep the muscle.” Because chromium is not particularly well absorbed, in supplements it is typically bound to picolinate, a derivative of the amino acid tryptophan, which is thought to stabilize the chromium and enhance its absorption.

Does it work?

Chromium gained popularity as a “fat-burning” supplement in the late 1980’s when two poorly controlled, unpublished research studies indicated that, when combined with a strength training program, chromium supplementation could promote increases in muscle mass and reductions in body fat. The studies were later severely criticized and discounted due to significant flaws in the research methods (*i.e.*, body composition was measured via skinfolds, dietary intake was not monitored, and initial chromium status of the subjects was not evaluated). Additionally, the fact that the primary investigator in the studies was a consultant to Nutrition 21, the company that holds the exclusive U.S. patent rights for chromium picolinate, lent suspicions to the validity of the research studies.

More recent research has failed to support effectiveness of chromium supplementation. In one study, young men were supplemented with chromium (200 ug/d) or a placebo while actively engaging in a weight training program (three times a week for approximately one hour) for 12 weeks. The results showed that there were no significant differences between the supplemented group and the placebo group in strength gains, muscle mass gains, or body fat loss. In fact, the only

identifiable difference between the groups was the significantly higher urinary chromium levels (about nine times greater) in the supplemented group compared to the placebo group.

Is it safe?

The vast majority of studies of chromium supplementation have revealed no severe side effects, other than mild gastrointestinal distress. However, most studies are relatively short in duration (< 12 weeks), so the long-term effects of chromium supplementation are currently not known. Recent anecdotal reports and at least two case studies have documented more severe side effects including anemia, memory loss, and DNA damage. One case study described a 33 year-old woman who developed anemia, liver dysfunction, and renal failure as a result of consuming chromium picolinate supplements (1,200-2,400 ug/d) for a period of four to five months to enhance weight loss. In addition, chromium picolinate has been shown to cause DNA damage in isolated cells that could, theoretically, lead to genetic mutations and cancer.

The bottom line

Chromium has not been shown to be effective in promoting fat loss or muscle tissue gain. Some chromium proponents have promoted supplementation citing a recent report claiming that Americans only get, on average, a quarter of the current Dietary Reference Intake (DRI) for chromium due to highly refined diets. While it is true that the typical American diet is not particularly well-balanced, this is not a valid reason to supplement with chromium. If you are concerned that you may be lacking in chromium, you would be best advised to increase your consumption of whole grains and vegetables, or sprinkle a little bit of brewer’s yeast on your cereal.

Look for Part Two profiles on 7-keto-DHEA, Pyruvate, Chitosan, and Hydroxycitric Acid.

Update



THE LATEST ON ERGOGENIC AIDS

by Kent Johnson, Ph.D., FACSM

We move in a very fast-paced society. In many cases, fast food and “eating on the run” is the norm rather than the exception. Because of

our lifestyles, it sometimes becomes difficult to eat a wide variety of healthy foods. For some people, dietary supplements help bridge the gap for nutritional inadequacies. While dietary supplements were never intended to replace sound nutrition, they can enhance and fortify our nutritional strategies. Are dietary supplements helpful and healthy? Are they safe to use? For most people, dietary supplements are safe. However, it is important to read all labels and be fully informed about any product taken as a supplement.

Dietary Supplements

Americans spend billions of dollars per year on dietary supplements. According to one source, at least one in three individuals are taking some form of dietary supplement daily, and the numbers continue to rise. Dietary supplement companies spend millions of dollars each year marketing their products. Indeed, it is almost impossible to read a health/fitness magazine without being inundated by advertisements for dietary supplements. In the midst of all the propaganda, how does the consumer sort out fact from fiction? It is important for all of us to make wise nutritional decisions, and dietary supplements can play an important role if the consumer is well informed and makes wise choices.

According to the Dietary Supplement Health and Education Act (DSHEA) passed into law in 1994, a dietary supplement is “any product (other than tobacco) intended to supplement the diet that contains one or more of the following ingredients: a vitamin, mineral, herb or other botanical; an amino acid; a concentrate, metabolite, constituent, extract or combi-

nation of any of these ingredients.” In addition, dietary supplements cannot be represented as conventional foods. Dietary supplements can be used to enhance or fortify improper or inappropriate food consumption. While most dietary supplements are beneficial, or at least not harmful, there are a few products that are proving to be harmful to some susceptible individuals. One such herbal ingredient found in some dietary supplements is ma huang.

Ma huang is an herbal additive in some weight loss and energizing, so-called “metabolic enhancing” products. Ma huang contains ephedra alkaloids, which have similar action to the hormones of the sympathetic nervous system. Far Eastern cultures have used ma huang medicinally to treat illness for many years. In our culture, however, it has recently been used as an additive to weight loss and energy boosting products. It is important to remember that the Food and Drug Administration (FDA) does not regulate dietary supplements as it does nutritional products. Therefore, the amount of ephedra one may ingest from product to product may vary. In fact, one study looked at the ephedra concentration in nine randomly selected dietary supplements containing ma huang. These authors found a variation in ephedra concentration between 1.08-13.54 mg per recommended dose. They also discovered a lot-to-lot variation of 137 percent. Most individuals can consume ma huang without any serious side effects, but the FDA is currently investigating more than 1,000 complaints from consumers of alleged medical and psychosomatic complications from supplements containing ma huang.

Another recent study published in the *New England Journal of Medicine* concluded that of the 140 reports of adverse events related to the use of dietary supplements containing ma huang and ephedra alkaloids submitted to the FDA between June 1, 1997 and March 31, 1999, 31

percent were considered to be definitely or probably related to the use of supplements containing ephedra alkaloids, and 31 percent were deemed to be possibly related. The conclusion from this analysis was that dietary supplements containing ephedra alkaloids may pose a health risk to some people. Other research reports have linked the use of ma huang to medical and psychiatric problems.

The take-home message for most consumers is to be aware of the ingredients in dietary supplements and consult with your health-care professional if you have questions or concerns.

Where Can I Find Information?

There are many good sources of information concerning dietary supplements. One good source can be found on the Web at www.supplementwatch.com. This site contains up-to-date, unbiased information about dietary supplements, and reports scientific information about the supplement in question. One area in this site is their “Top 5 Most Visited Product Review” link. This contains information on the top five dietary supplements that consumers have recently accessed.

Another outstanding resource of information on dietary supplements is the Alternative Medicine site at the National Institute of Health (NIH). The URL is www.nccam.nih.gov. This site provides an abundance of research and information concerning dietary supplements.

Consumers should be aware of all ingredients in dietary supplements before using them. For most, dietary supplements can be used safely to enhance their nutritional strategies. However, for some, certain products may pose a health risk. If you have questions about the safety of any dietary supplement, it is wise to consult with your local health-care provider. Remember, dietary supplements were never intended to replace good nutrition. Eat healthy!

Feature



LEARNING MORE ABOUT MICRONUTRIENTS

by Stella L. Volpe, Ph.D., R.D., LD/N, FACSM

Athletes often work out three to seven days per week, and as much as two or more hours per day.

With all this exercise, it would seem obvious that these individuals would need more vitamins and minerals than sedentary individuals. However, most of the research has shown that athletes typically do not require more vitamins or minerals than the sedentary person. That may sound surprising, but it is true. A basic background of the function of vitamins and minerals is necessary to learn more about micronutrients and their role in our diets.

What are micronutrients?

Vitamins and minerals, also called micronutrients because our bodies need such small quantities of them, are required for normal functioning of our bodies. Without the appropriate amount of vitamins and minerals, some of the functions of our bodies might not work as well as they should. For example, if someone has iron deficiency anemia, the way he/she uses oxygen is impaired, and one of the obvious signs is feeling tired, including during exercise.

However, does this mean that athletes need more micronutrients than non-athletes? The evidence so far does not support this. However, there are times when athletes may need more vitamins and minerals. Examples of such needs may include:

1) Iron depletion and iron deficiency anemia

For athletes who may be in sports where weight loss is required (wrestling, crew, or jockeys in horse racing) or a low body weight is expected or desirable (gymnastics, figure skating, track), consumption of enough food is often an issue. These athletes often do not eat red meat (one of

the best sources of iron), and they may not consume good non-meat sources of iron (like green, leafy vegetables). In this case, athletes may become either iron depleted (their blood ferritin levels [stores of iron] are low), or iron deficient (their blood ferritin levels plus their hematocrit and hemoglobin levels in their blood [measures of iron status] are low). If athletes think they have iron depletion, or iron deficiency anemia, because they feel tired and are not performing well in school, work, or practice (low iron levels affect cognitive and physical functions), they should have their blood levels checked for iron depletion or deficiency. If they are deficient, the health-care professional will prescribe iron supplements, typically in the form of ferrous sulfate or ferrous gluconate. With about four months of supplementation, their iron depletion or deficiency should be resolved.

2) Calcium levels

Calcium is another nutrient that many people, in general, do not consume at recommended amounts. Many individuals only consume about 600 to 800 milligrams of calcium per day, when the recommended intakes range from 1,000 to 1,300 milligrams per day. This is another nutrient that is especially low in diets of athletes who strive to keep their weight low. Good sources include dairy products (for example, a cup of yogurt has about 400 milligrams of calcium, and is also a good source of protein), green leafy vegetables (like spinach or broccoli), and calcium-fortified tofu or soy milk. If it is difficult for individuals to consume these products, a supplement of calcium citrate or calcium carbonate at 500 milligrams in the morning and 500 milligrams in the evening (these are average recommendations, a person may need more or less than these) is recommended because calcium is absorbed better if the doses are split. It is also recommended that in-

Table 1. Dietary Reference Intakes (DRI) and Tolerable Upper Intake Levels (UL) for Selected Minerals and Vitamins

Age (years)	Iron (mg/day) (DRI)	Iron (mg/day) (UL)	Calcium (mg/day) (DRI)	Calcium (mg/day) (UL)	Vitamin B ₁₂ (µg/day) (DRI)	Vitamin B ₁₂ (µg/day) (UL)
9 to 13						
Males	8	40	1300	2500	1.8	ND*
Females	8	40	1300	2500	1.8	ND
14 to 18						
Males	11	45	1300	2500	2.4	ND
Females	15	45	1300	2500	2.4	ND
19 to 30						
Males	8	45	1000	2500	2.4	ND
Females	18	45	1000	2500	2.4	ND
31 to 50						
Males	8	45	1000	2500	2.4	ND
Females	18	45	1000	2500	2.4	ND
51 to 70						
Males	8	45	1200	2500	2.4	ND
Females	8	45	1200	2500	2.4	ND
> 70						
Males	8	45	1200	2500	2.4	ND
Females	8	45	1200	2500	2.4	ND

Note: DRI's have several subcategories, but for ease of understanding, "DRI" was used here. UL is actually one of the DRI subcategories, but it is listed separately, because it represents the maximum amount of a nutrient that should not result in any adverse effects. It does not mean, however, that individuals should consume the UL amount. The DRI amounts have been found safe for healthy individuals.

*ND = Not determinable because of lack of data.

Table is adapted from: Trumbo P, Yates AA, Schlicker S, Poos M. (2001). Dietary Reference Intakes: vitamin A, vitamin K, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc. *The American Dietetic Association*, 101(3): 294-301.

individuals take the supplements with 200 International Units (IU) of Vitamin D with each supplement (thus, a total of 400 IU per day). Vitamin D helps calcium absorption. Calcium is not only necessary for strong bones and teeth, but is involved in muscle contraction, so it can have a big effect on athletic performance.

3) Vitamin B12

Vitamin B12 is a micronutrient that can be low in athletes who are vegetarians, because it is found only in animal products. This same vitamin is also sometimes low in older individuals (older than 50 years), because they have difficulty with its absorption. Consumption of animal products will help in obtaining this vitamin. Older individuals and vegans (those who consume no animal products) may also need to supplement with vitamin B12.

If athletes are not depleted in any vitamins or minerals, but still feel compelled to take multi-vitamin/mineral supple-

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Feature



EATING FOR HEALTH AND ATHLETIC PERFORMANCE: THE GLYCEMIC INDEX

by John P. Kirwan, Ph.D., FACSM

Wondering about the best way to fuel your body before an endurance event such as a race, a bicycle tour, or even an intense workout at the gym? Or perhaps you're in the midst of another busy workday; you've been racing against the clock since early morning, and lunch is still hours away. Feel yourself running out of steam? Recent research suggests that meals with a low or moderate glycemic index provide sustained energy to significantly boost exercise capacity, increase endurance, and extend the time before you need to refuel. These meals may also provide "slow-burning" sustained energy that lasts longer into an active day, which may help maintain a feeling of fullness and stave off hunger pangs that cause increased caloric intake eating during the day. Does this sound like another mythical magic bullet, or can the glycemic index of foods really make a difference to your health and performance?

The Glycemic Index (GI)

The glycemic index (GI) is a nutritional tool designed to provide information on the blood glucose response to common foods compared to 50 grams of a carbohydrate reference, either glucose or white bread. The concept was originally developed more than two decades ago by David Jenkins and colleagues at the University of Toronto as an aid in the clinical management of diabetes. They observed that the blood glucose response is not a simple function of the total amount of carbohydrate in the food. Instead, it is related to a complex interplay among a host of factors that affect digestion and absorption, which in turn determine the rate of glucose entry into the blood. These factors include the amount of fiber in the food, type of starch, type of sugar and even the method of cooking. Typically, foods with a lower glycemic index have a high fiber content, contain

amylose (long chains of glucose molecules, difficult to gelatinize and digest) rather than amylopectin (chains of glucose joined in a branching pattern easier to gelatinize and digest), contain fructose (e.g. fruits), and are relatively unprocessed.

To calculate the GI of a food, blood glucose levels are measured at 30 minute intervals for two hours after eating. The area under the glucose response curve is calculated, and the result is expressed as a percentage of the area produced by the reference food. Foods can then be ranked from high (>70 GI) to low (<40 GI) based on the calculated index (see Table). So, if you need to raise your blood glucose quickly, then a high-glycemic food should be eaten, but if you want a more sustained and slower response, then moderate and low glycemic foods are a better choice.

Low GI (<40)

- Barley kernel bread - 34
- Yogurt - 33
- Apple - 38
- Bran Cereal - 38
- Spaghetti - 37

Moderate GI (40-70)

- Oatmeal - 61
- Apple muffin - 48
- Banana - 55
- Linguine - 55

High GI (>70)

- Doughnut - 76
- Waffles - 76
- Corn flakes - 74
- Mashed potato - 70
- Watermelon - 72

Exercise Performance

Many athletes are extremely conscientious about their pre-event or pre-training meals, and rightly so. Eating the correct food can boost fuel availability during the activity and enhance performance. However, foods with a high glycemic index may sometimes cause a reactive hypoglycemia, or low

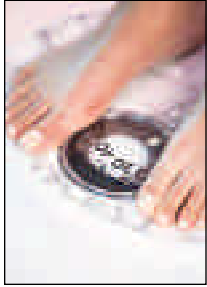
blood sugar. When this occurs, exercise performance is impaired and the athlete often feels nauseated. While there are some disagreements in the literature regarding the benefits of pre-event low versus high glycemic meals, the majority of studies support the view that a moderate to low glycemic meal is advantageous. In our studies with moderate glycemic breakfast cereals, we have found that healthy young men and women perform on average approximately 25 minutes longer when they eat oatmeal, a moderate GI food, 45 minutes before exercise. The improvement appears to be related to the effect of the oatmeal on fuel use at the start of exercise. Because moderate and low glycemic meals produce a delayed or blunted glucose response, the insulin response that follows also is delayed. Normally, insulin is involved in controlling fuel use in muscle, by suppressing the process of burning fat and facilitating carbohydrate use. If insulin is elevated at the start of exercise, the muscles will tend to burn more carbohydrate instead of fat and in turn use up the limited glucose that is available. During prolonged and sustained exercise, hypoglycemia can be a primary cause of fatigue. Therefore, depletion of limited glucose stores during the initial phase of an exercise bout may prove detrimental to physical performance. Moderate to low glycemic foods will help to counteract this effect.

Post-exercise nutrition

In contrast to the pre-exercise meal, after exercise, high glycemic carbohydrate-rich foods and drinks may be advantageous in that they quickly replace the liver and muscle glycogen stores depleted during the activity. Studies have demonstrated that the first two hours after exercise represents an important period in the fuel recovery process. High glycemic

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The Athlete's Kitchen



WHAT TO SAY WHEN DIETERS LOSE WEIGHT

by Nancy Clark, M.S., R.D.

"My wife has lost about 30 pounds. She looks great!"

"My roommate has dropped 10 pounds.

She's down to a size four and I'm so jealous...!"

"My brother is dieting by eating only one meal a day. He has shed 20 pounds in three weeks and he looks awesome!"

We all know someone who has lost weight and our knee-jerk response is "Wow... Don't you look great!" At diet workshops, the leader and participants applaud the successful dieters who, upon weighing in, register a lower weight on the scale. Advertisements for weight loss programs idolize how much better you'll look when you shed excess flab. High schools runners ogle over their friend's loss of two pounds.

This praise is intended to be positive, but you should be aware that it can sometimes backfire. The following story is directly from an athlete in recovery from anorexia, and perhaps can teach you how to acknowledge weight loss wisely.

"When I was a student in medical school, I was very unhappy and my life felt out of control. I followed my strong desire to be able to control something, so I started to diet and exercise. I got a bit carried away and within a year, I had to admit myself into an eating disorders program. The surprisingly sad part is no one saw my unhappiness. Mind you, I was in medical school, surrounded by health professionals, and I got nothing but praise the whole way down. Doctors, nurses, friends and family alike would say to me: 'You've lost weight. Don't you look great,' or 'You are so dedicated with your exercise program. I feel like I barely have time to sleep, but

you manage to get up early enough to run an hour every day. You're too good,' and 'You always eat such healthful foods; salads, fruits, rice cakes. I'm living on junk out of the vending machine, and you're preparing your own healthy foods every day. You are just so dedicated when it comes to eating well. I admire you.'"

The praise and compliments flowed endlessly, but no one saw this woman's unhappiness. Twenty pounds later, and exhausted with compulsive, relentless exercise, she ran out of energy and admitted herself into a hospital program for people with eating disorders. She knew her lifestyle was sick, but no one else had seemed to notice. No one made a comment like, "You are looking very thin... are you feeling okay?" or "I'm worried about you. You look so tired and seem to have lost that sparkle in your eyes."

A similar episode took place in a health club. A 39 year-old man just trying to get back to his college "fighting weight" started dieting and exercising to the extreme. He claimed he was training for an Ironman triathlon. The truth was, he was abusing exercise to lose weight. His thoughts about food and exercise consumed most of his day, to the point he did little but exercise, work, sleep, and (try not to) eat. He also heard nothing but praise about his changing body like, "You look great... How much weight have you lost?" and "You are so dedicated with your training program. How do you find time to exercise for two hours every day? You are a better man than I," and "You are so good with your diet. I wish I had your discipline when it comes to eliminating junk food from my life."

After a year, this exhausted "athlete" ended up in my office saying "I don't know if I need to see you or a psychologist."

In both cases, these "athletes" got nothing but praise as they tumbled into their eating disorders. Granted, their friends, teammates and training partners were not responsible for this happening, but they failed to say appropriate words.

What should you say when someone has lost weight? What you do not want to say is "Have you lost weight? You look great!" This implies: 1) they looked horrible before; 2) physical size is more important than health and 3) they are a better person if they are lighter.

And what happens when the dieter regains the weight, which is a common occurrence? Does he or she revert to being a worse person?

Be it two pounds or 20 pounds, the better way to acknowledge weight loss is to shift the focus away from physical weight changes and focus instead on the praiseworthy aspect: the person's improved health status. Here are some recommended phrases to share with dieters who are losing or have lost weight:

- "You look like you've been working hard at losing weight."

The dieter will be ever-ready to talk about how proud they are of their hard work. Let them brag.

- "You look smaller. Is there is less of you to love?"

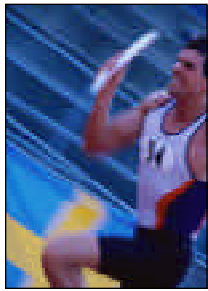
The message is, you are not a better person if you lose weight, you are just less.

- "You look pleased with your weight loss. How do you feel about it?"

They'll undoubtedly feel healthier and more energetic.

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feature



ANTIOXIDANTS IMPORTANT FOR ATHLETES

by Allan H. Goldfarb, Ph.D., FACSM

What are antioxidants?

Antioxidants are substances that can help protect cells from potentially dangerous molecules that react with cell components. These dangerous molecules are called reactive molecules because they have an unpaired electron. Thus, when these reactive molecules interact with cell components they make that molecule unstable. Antioxidants typically donate a hydrogen atom to the reactive molecule, but in some cases they can bind with these molecules and make them less active. These processes enable antioxidants to protect parts of the cell from damage that might otherwise lead to abnormal cell function, disease processes or cell death.

Numerous antioxidants are found within the body. Nutritional antioxidants are found in foods. Some chemical substances called phytochemicals are found in the plants and have antioxidant potential that may be beneficial for humans, but their exact role needs to be clarified.

Antioxidants within the body are often classified as enzymatic or nonenzymatic antioxidants. The enzymatic antioxidants are substances that speed up a chemical reaction. These antioxidant enzymes are manufactured by the body.

Common nutritional antioxidants

The most common nutritional antioxidants are vitamins C and E, beta-carotene, leutin and lycopene, and the mineral selenium. Other substances found in plants may act to inhibit the absorption of reactive molecules. These substances are often found in teas. Certain foods may have phytochemicals such as soy, which may also have antioxidant properties.

The antioxidant action of vitamin C has been shown to occur in the aqueous portion of the body, including the plasma and the fluid within cells (cytosol). The antioxidant action of vitamin E has been shown to occur in the lipid (or fat) portion of cells. This includes cell membranes and organelle membranes (membranes of structures within the cell such as the mitochondria). It is also stored in fat deposits. The carotenoids are also fat soluble and therefore protect the membranes of structures of the cell. The mineral selenium is a component of the antioxidant enzyme glutathione peroxidase.

There are specific recommendations for some of these nutritional antioxidants. The suggested amount for vitamin C is based on the recommended daily allowance (RDA), which currently is 90 milligrams per day for the average adult. The safe and effective amount for vitamin C is based on adverse reactions such as diarrhea and formation of calcium salt deposits. These adverse reactions can occur at a dose of >500 mg per day in some individuals. The recommendation for vitamin E is eight milligrams for women and 10 milligrams for men. International Units (IU) can be understood as 1 milligram = 1.49 IU. Vitamin E may be available in capsules in doses of 200 to 400 IU. It should be noted that vitamin E comes in a number of forms and the natural d-RRR-alpha tocopherol form has the greatest effect inside the body. Consumers should be aware that synthetic forms of vitamin E are metabolized and eliminated from the body faster than the natural form.

The carotenoids act to bind single oxygen molecules with lycopene demonstrating the highest activity. Currently there is no official RDA for carotenoids. However, beta-carotene is a precursor for vitamin

A, and the RDA for vitamin A is 1000 retinol equivalents (RE) for men and 800 RE for women. One RE is equal to one microgram. The need for beta-carotene is six times that of vitamin A or approximately six milligrams. The current suggested requirement for selenium is 55-70 micrograms.

Who needs antioxidants?

It should be noted that certain individuals might require more antioxidants, especially those who are more active and who exercise in greater amounts. The exact amounts, however, have not been established. It is known that high intensity aerobic exercise continued for at least thirty minutes can increase the production of reactive species and thereby hasten the use of existing antioxidants. Fortunately, aerobic training seems to enhance the person's ability to protect the body against these reactive species. Endurance training increases the body's ability to handle more oxygen usage in the cells by increasing mitochondria enzymes. Some of these enzymes help to process the oxygen to form energy. Some of the other enzymes increased are antioxidant enzymes. In addition, the endurance-trained individual may have better control of blood flow. All these factors help contribute to a reduced potential for reactive species damage. Smokers appear to require greater amounts of antioxidants because the materials within the smoke can interact with the cells within the lungs. In addition, the smoke has reactive molecules that can damage the lung cells.

Finally, it is not known how the combination of these antioxidants work together to assist the body not only in the protective function of reducing reactive species but to improve and reduce the incidence of diseases associated with the overproduction of these reactive substances.

Strength and Power

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Once you've determined your carbohydrate and protein needs, all the leftover calories come from fat. To keep your heart healthy, make sure that unsaturated fats from vegetable oils, grains, nuts and seeds make up the greatest proportion of your fat intake.

It's All in the Timing

When it comes to any form of training, it is essential to feed your body every two to three hours, as well as before exercise and as soon after exercise as possible. As a pre-exercise snack one to two hours before exercise, a 200-300 calorie combination of protein and carbohydrate may help to reduce the damaging effects of weight training on your tissues. Foods like a turkey sandwich, yogurt and fruit, or even an energy bar, work as good pre-exercise snacks.

After exercise, a combination of carbohydrate and protein within 15-30 minutes and again two hours later will help your muscle tissues recover, grow and prepare for the next time you exercise. Yogurt and fruit smoothies, a peanut butter and jelly sandwich and milk, or even meal replacement products are great choices for immediate recovery nutrition followed by a wholesome meal two hours later.

Hydration

Good hydration is essential for strength training and muscle building. Go into your workouts well-hydrated by drinking two cups (16 ounces) of fluid two hours before exercise. During exercise, drink four to eight ounces every 15 to 20 minutes. You may find that a sports drink helps you stay strong even at the end of your workout. After exercise, replace any further fluid losses with at least two cups of fluid. Another approach is to weigh yourself before and after exercise. Any weight lost is fluid. For every pound lost, replace it with two to three cups of fluid.

The Truth About Supplements

The truth about supplements is that most of them don't work very well. But in the past several years, creatine has gained notoriety among strength trainers: when combined with a good diet and strength training program, creatine has the potential to give you a slight energy edge during workouts, resulting in greater muscle growth.

Sports drinks are also effective supplements for strength trainers. Using fluid-electrolyte replacements during workouts will assist with hydration and maintaining energy levels throughout an intense workout. High-carbohydrate beverages and nutritional shakes are convenient, portable ways of consuming extra carbohydrates or as snacks before and after workouts or competitions.

Hard Work

Even though supplement purveyors promise easy results, gaining muscle takes determination, a good diet, and lots of hard work. Stick to it, and you'll be pleased with your results.

Q & A

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to ephedrine use, and there has been consideration to remove this substance from the non-controlled nutritional supplement list.

As with any supplement, proper use is critical to minimize side effects. Simultaneous use with caffeine or other stimulants should be avoided. Since all stimulants cause increased urine output, proper hydration is essential, particularly

with exercise in the heat. If one has a previous or current medical condition that calls into question the use of supplements with ephedrine, discussing use with a physician is necessary. Finally, the common adage "a little is good, a lot is better" can not only be dangerous, it can be deadly.

Q: Do athletes involved in weight training need extra protein in their diet?

A: This depends on how much protein the athlete is currently getting from their diet.

The average RDA recommendation is 0.8-1.0 g/kg/day. Doubling this amount is more than adequate for weight training. This should be sufficient for the increased protein turnover, muscle tissue hypertrophy and repair. This need can easily be met by adding servings of meat, dairy, beans, and grains to one's diet. Buying expensive protein supplements are not necessary. With weight training, adequate carbohydrates are needed in the diet to maintain energy stores. Otherwise, the extra protein ends up as fuel for work, not increasing muscle mass.

Micronutrients

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ments, it is recommended that they do not exceed the Dietary Reference Intakes (DRI) for each vitamin or mineral. In ad-

dition, if athletes do supplement, and they do not have an overt deficiency, then taking a supplement every other day would be prudent and also save money. However, the best way to get all the vitamins and minerals required is through foods,

especially whole grain foods, fruits, and vegetables. The less processed a food, the more nutrients it will contain. Although it seems like a boring adage, moderation and variety are the keys to health and exercise performance.

Glycemic Index

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foods and drinks taken during this period can raise blood glucose quickly, therefore increasing the total amount of carbohydrate available to the muscle. Through this mechanism, glycogen stores can be replenished efficiently and you will be better prepared to train or compete two or even three times a day. So, if you need to refuel quickly after exercise, high glycemic carbohydrate-rich foods and drinks should be your choice.

Obesity and Weight Loss

Obesity has become a health problem of epidemic proportions in the United States during the last few decades, and now more than half of the population is classified as being overweight or obese. It has become increasingly clear that our lifestyle, which features low levels of physical activity and a high-calorie, high-fat diet, is the primary contributor to these changes. However, there is not much evidence that altering the fat content of the diet has done much to reverse these trends. Indeed, if anything, obesity has increased despite a general reduction in fat intake among the general

population. Regretfully, we have replaced fat with high-starch foods and sugars which have a high glycemic index. The resulting physiologic response to these foods triggers high insulin levels, which may in turn stimulate your brain and generate signals that cause you to eat more. Chronically elevated insulin levels may also interfere with how your body processes the energy you are getting from the food, and may cause more of this energy to be deposited as fat. In contrast, foods that have a low glycemic response tend to be more "filling," do not trigger an exaggerated insulin response and, although it has yet to be demonstrated in a prospective research study, may prevent weight gain.

Health Benefits

There is also some evidence that the dietary glycemic load, (*i.e.*, glycemic index carbohydrate content) may contribute to heart disease. Epidemiological studies have shown that there is a positive association between high cholesterol, high triglycerides, an elevated pro-inflammatory response and ischemic heart disease in people who eat a diet with a high glycemic load.

If you are pregnant, the glycemic index of the foods you eat may also be important. Women who eat a high glycemic carbohydrate diet during pregnancy experience higher blood glucose and insulin than women who eat a low glycemic diet. Elevated blood glucose contributes to increased birth weight of the baby and greater maternal weight gain. Furthermore, for women who exercise during pregnancy, the blood glucose response is more pronounced on a high glycemic diet than for a low glycemic diet. So if you want a normal weight healthy baby, pay attention to the type of carbohydrates in your diet, especially if exercising during your pregnancy.

Whether your goals are to improve your athletic performance or exercise training ability, lose weight or prevent weight gain, lower your cholesterol or promote your health and that of your baby during pregnancy, there appears to be some merit in exploring whether the glycemic index will work for you. Some simple food substitutions may be all that is needed, and you may perform and feel much better as a result.

Lose Weight

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• "You are looking more fit. How are your workouts going? How is your energy level? How do you feel?"

If they are losing weight appropriately, they'll feel great.

• "You appear to be trading some of your excess fat for muscle."

Acknowledge what you see, but don't suggest they are a better person.

Sometimes you can just say nothing. After all, it may not be appropriate to acknowledge weight loss or weight gain unless the person looks stressed or exhausted.

Regardless of the dieter's response, the goal is to help the person hold a solid appreciation of their value as a person. Their beauty is in their smile, their friendship and caring, not in being size two instead of size 12. Dieters need to know they are loved from the inside out, not judged from the outside in. And hopefully, they are healthier, more energetic, stronger, and happy with these benefits.